Warranty Registration for Model 102 B Date Received _____

Serial No. _____ Condition of unit on receipt: ☐ satisfactory; ☐ unsatisfactory (why) _____

Name of person who decided to purchase instrument _____

Title _____ Company _____

Address _____

DESIGN AND COMMUNICATION INFORMATION

What application is this unit intended for: _____

Range unit to be used on _____

To you, what are the most important features of this instrument _____

Do you have any design suggestions concerning this unit _____

Where did you learn about this instrument:

- ☐ Keithley Catalog
- ☐ Keithley field engineer
- ☐ Associate's recommendation
- ☐ Technical articles or Product Releases
- ☐ Keithley Engineering Note
- ☐ Magazine ad _____ (which one)
- ☐ Trade Show _____
- ☐ Directory _____
- ☐ Other _____

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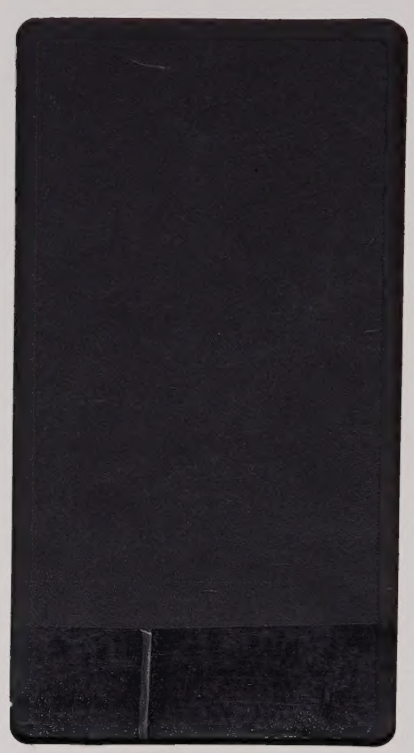
INSTRUCTION MANUAL

MODELS 102B, 102B-R1, 102B-R2, 102B-R3

DECADE ISOLATION AMPLIFIERS

KEITHLEY INSTRUMENTS



INSTRUCTION MANUAL

MODELS 102B, 102B-R1, 102B-R2, 102B-R3

DECADE ISOLATION AMPLIFIERS

WARRANTY

We warrant each of our products to be free from defects in material and workmanship. Our obligation under this warranty is to repair or replace any instrument or part thereof (except tubes and batteries) which, within a year after shipment, proves defective upon examination. We will pay domestic surface freight costs.

To exercise this warranty, call your local field representative or the factory, DDD 216-795-2666. You will be given assistance and shipping instructions.

REPAIRS AND RECALIBRATION

Keithley Instruments maintains a complete repair service and standards laboratory in Cleveland, and has an authorized field repair facility in Los Angeles.

To insure prompt repair or recalibration service, please contact your local field representative or the plant directly before returning the instrument.

Estimates for repairs, normal recalibrations, and calibrations traceable to the National Bureau of Standards are available upon request.

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FIGURE 1. Keithley Model 102B Decade Isolation Amplifier.

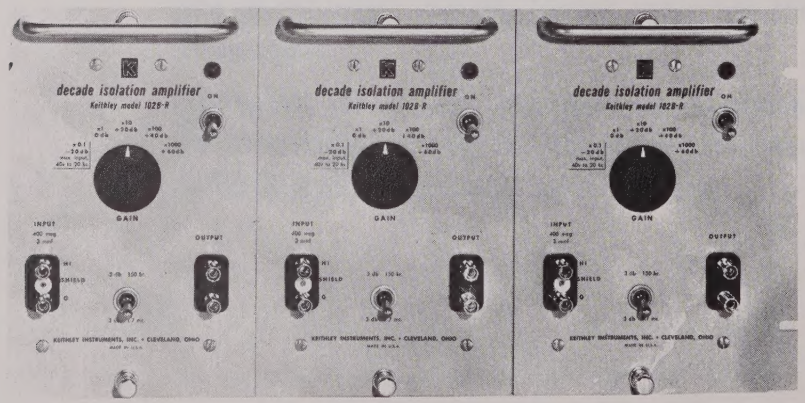


FIGURE 2. Keithley Model 102B-R Amplifier, rack mounted version with space for one to three Model 102B units.

SECTION I INTRODUCTION

The Keithley Model 102B Decade Isolation Amplifier is a general-purpose laboratory instrument. With its high input impedance, low output impedance, and wide range of accurate gains, it can be used in most applications requiring amplification from 0.5 cps to 2.1 mc or as part of an operating system.

The Model 102B can be used to amplify the output of pressure pickups, accelerometers and other low-level or high impedance transducers for examination by various oscilloscopes or analyzers. It is also used for bridging test and analysis equipment, such as vacuum tube voltmeters and oscilloscopes, into high impedance vacuum tube circuits. The choice of connecting directly to the input terminals of the Model 102B through the Models 1021 and 1022 Probes, or through special connectors assembled by the user, provides further flexibility.

Cathode ray oscilloscopes, analysis and recording apparatus, and a majority of electronic voltmeters have input impedances of about 0.5 to 2 megohms shunted by 15 or 40 pf. Test leads add from 10 to 200 pf more capacitance. The characteristics of a high impedance circuit, such as a pentode amplifier stage with a one-megohm plate load resistance or a crystal transducer are appreciably changed when such instruments are connected directly to it. The Model 102B with its input impedance of greater than 400 megohms shunted by 3 pf, however, can be connected to a typical high impedance circuit or transducer without affecting its operation. The output impedance of the 102B is sufficiently low that test instruments will operate from it without error.

Models 102B-R1, 102B-R2 and 102B-R3: The Models 102B-R1, 102B-R2 and 102B-R3 have 1, 2 and 3 units respectively mounted on an 8-3/4 inch X 19 inch relay rack panel. (See Figure 2.) The controls are the same as on the 102B. Mechanically, the rack-mounted models differ only in having a front panel extended at top and bottom to permit bolting to a modified 8-3/4 inch X 19 inch rack panel furnished by Keithley Instruments, Inc. Up to 3 instruments can be mounted in the panel and each is readily removable for servicing.

SPECIFICATIONS

DECADE GAINS: 0.1, 1, 10, 100, 1000, accurate within 1%.

INPUT IMPEDANCE: Over 400 megohms, 3 picofarads.

OUTPUT IMPEDANCE: Under 50 ohms, 20 microfarads; lowest allowable load impedance is 5,000 ohms for full output.

FREQUENCY RESPONSE: For 1.7 Mc bandwidth position: 2 cps to 1.7 Mc $\pm$3 db on 100 and 1,000 gains; 0.5 cps to 2.1 Mc $\pm$3 db on other gains; 5 cps to 300 kc within 2% on all gains.

For 150 kc bandwidth position: within 3 db from 2 cps to 150 kc on all gains; within 2% from 5 cps to 20 kc on all gains.

RISE TIME: To 63% when driven from a low impedance source on gains of 1,000 and 100 is 0.3 microsecond, and 0.15 microsecond on other gains, with less than 10% overshoot or ringing with or without probes.

PHASE SHIFT: On the 1.7 Mc bandwidth is within 3^{o} from 20 cps to 50 kc, and within 1^{o} from 60 cps to 20 kc. On the 150 kc bandwidth, it is within 3^{o} from 20 cps to 8 kc, and within 1^{o} from 60 cps to 3 kc.

MAXIMUM OUTPUT: 5 volts rms into 5,000 ohms on all gain settings below 300 kc, falling 1 volt above 1 Mc.

MAXIMUM INPUT: Conforms to maximum output, except at 0.1 gain, where it is 40 volts rms up to 20 kc, falling to 5 volts at 100 kc.

HARMONIC DISTORTION: At midband is less than 0.1%.

MAXIMUM RMS NOISE: Above 10 cps, equivalent at input is given below. Noise below 10 cps is about 10 times higher.

Model	1000 Gain		10 Gain	
	10 cps 1.7 Mc	10 cps 150 kc	10 cps 2.1 Mc	10 cps 150 kc
102B (input shorted)	20 μv	10 μv	30 μv	15 μv
102B (1 megohm 22 picofarads at input)	25 μv	15 μv	36 μv	22 μv
102B and 1022 probe (1 megohm across probe)	25 μv	15 μv	36 μv	22 μv
102B and 1021 probe (1 megohm across probe)	80 μv	40 μv	80 μv	45 μv

POWER REQUIRED: 105-125 volts (or 210-250 volts), 50-60 cps, 50 watts.

DIMENSIONS: 7-1/2 inches high x 5-1/8 inches wide x 11-1/4 inches deep.

NET WEIGHT: 10-1/2 pounds.

ACCESSORIES AVAILABLE: Model 1021 Probe, Model 1022 Probe, Model 1023 Output Amplifier.

SECTION II DESCRIPTION

The Model 102B Decade Isolation Amplifier consists of four major electrical sections as shown on DR 11310-D, enclosed: the input, V1 and V2; middle amplifier, V3 and V4; output amplifier, V5 and V6; and the power supply, V7, V8, V9 and V10.

Because of the feedback from V2, V1 has a very high effective input resistance and a low input capacitance. Enclosing the input terminal in a driven shield reduces the stray input capacitances to a total of 3 pf. The driven shield is also connected to the pin jack between the input terminals for driving shielding in a Model 1021 Probe.

The driven shielding potential is just slightly less than the instantaneous potential of the signal conductor. The circuit or transducer being tested, therefore, has to supply only a fraction of the usual charging current, thus reducing the effective input capacitance of both the internal wiring and an external cable with the driven shield. In other words, V2 of the input amplifier supplies the charging current for the input.

On gains of x1000 and x100, both the middle and output amplifiers are used; a 10:1 attenuator is used just ahead of the output amplifier on gain of x100. On the lower gains, the middle amplifier is disconnected and the output amplifier and the attenuator between it and the input stage control the overall gain of the instrument.

The input section has a gain of essentially 1.00, the middle amplifier 100, and the output amplifier 10.

Accurate and stable resistors, substantial feedback, and the regulated power supply assure accuracy of the gains.

The 102B is housed in an upright cabinet, with the control panel on the front. The GAIN is the most prominent control, located in the middle. The power switch and pilot light are in the upper right corner. The input terminals are in the lower left corner, and the output terminals are at the lower right. Between the the input and output terminals is the high frequency cut-off switch (upper 3 db point selector). This control may be set at a 3 db point of 150 kc or 1.7 mc depending on the noise-bandwidth requirements.

The power cord is at the rear of the cabinet, and connects directly to the 50-60 cps, 115 volt power source. If a 230 Volt source is to be used, take steps described under Section III Operation.

Maximum and Minimum Input Voltages: The maximum voltage permissible at the input is 40 rms with a sinusoidal wave, or about 100 volts peak-to-peak. This is with the gain set at 0.1 and at frequencies below 20 kc. Above 20 kc, the input stage is no longer linear at such high levels. With gains of 1.00 through 1000, the maximum input signal is that which will produce an output of 5 volts rms.

The input coupling capacitor has a rated breakdown of 1000 volts. We recommend, however, that no more than about 750 volts dc be applied to the 102B input.

The noise background above 10 cps of the Model 102B is equivalent to less than 20 microvolts rms at the input with the test leads connected together and the bandwidth switch at 1.7 mc. With the switch at 150 kc, the noise will be less than 10 microvolts rms. Thus signals as low as 50 microvolts rms may be readily observed.

As the impedance of a signal source is increased, the effective noise background of a connected amplifier increases. This is caused by increased thermal noise in the source and the characteristic operation of the input tube. The noise level of an amplifier is conventionally given with the input short-circuited.

When using the Model 102B in conjunction with other instruments, the gain of the 102B should always be as high as possible without overloading, and the gain of the equipment following it should thus be as low as possible so that the noise in the late stages of the Model 102B will be amplified the least. This gives the highest signal-to-noise ratio.

Gain and Frequency Response: The Model 102B has gains of 0.1, 1, 10, 100 and 1000, accurate to within 1%.

The regulated B supply aids materially in reducing spurious low frequency output caused by line voltage changes. These changes cause the pattern on an oscilloscope screen to shift when observing low level signals, if the oscilloscope amplifiers have response below about 1 cps.

Maximum Output Voltage: The maximum undistorted output voltage permissible up to 300 kc is 5 volts rms. Above 300 kc, the undistorted output decreases gradually to 1 volt rms at 2 mc.

Output Impedance: The dynamic internal impedance is less than 50 ohms resistance in series with 20 uf. The impedance is constant for all GAIN settings.

5000 ohms is the lowest impedance which should be connected to the Model 102B output if the rated output voltage is to be developed, and the normal frequency range employed.

If the best transient response at high frequencies is desired, the output should not be loaded with greater than 200 pf.

SECTION III OPERATION

The Decade Isolation Amplifier is shipped ready to operate. Connect the power cord, and turn the On-Off switch to On. The standard instrument is wired for 115-volt operation and is suitable for 50 or 60 cps. If your instrument was ordered for 230-volt operation, there should be a stamped indication above the power cord on the rear of the cabinet. If you want to modify a unit for 230 volt operation:

1. Remove cabinet by removing two screws on each side.

2. Remove four screws holding condenser board (left lower rear side of chassis) and swing board forward.

3. Disconnect jumpers which tie pins 1 and 3 and pins 2 and 4 together on transformer input.

4. Tie pin 2 to pin 3.

5. Re-assemble.

In making measurements, a probe or leads are connected from the input terminals to the circuit whose characteristics are to be studied. The desired measuring and indicating instruments are connected to the Output terminals. The GAIN is then adjusted for best operation, and the bandwidth position is chosen so that optimum bandwidth-noise requirements are met.

A certain amount of caution should be observed when using a sensitive voltmeter with the Model 102B. Because of the extremely high input impedance, pickup of stray fields is rather large, and as much as 30 volts can be developed at the output when the test leads are lying unconnected.

The input terminal arrangement permits a wide variety of applications of the 102B:

a. Direct Connection: Circuits can be connected directly to the input terminals in conventional fashion.

b. Model 1021 Probe: The Model 1021 Probe uses a 30-inch double-shielded cable. It presents only 5 pf to the test circuits, and it is useful from 2 cps to 150 kc.

c. Model 1022 Probe: The Model 1022 Probe uses a low capacitance cable. It has 20 pf input capacitance, and it is useful from 2 cps to 1.7 mc.

d. Special Inputs: The user can construct special input circuits using the most suitable input receptacles and cables. One suggestion is the use of low capacitance cable with a divider in the probe to increase the input impedance further. Another suggestion is to use the shield terminal of the 102B input to drive a specially

shielded configuration around a connector or a doubly shielded cable. In using the driving amplifier, two limitations should be kept in mind. First, the amplifier is limited in its driving capabilities; Table I gives the relationship between the capacity of the driven shielding to ground and the maximum working frequency. The other limitation is that a driven shielded input has a negative input resistance at the higher frequencies. This is of no consequence with capacitive or resistive signal sources; but with inductive signal sources, oscillation can be produced at the resonant frequency of the capacitance of the signal conductors to the driven shielding and the inductance of the source. A 100,000-ohm resistor in series with the HI conductor of the probe usually suffices to suppress the oscillating condition, and does not greatly affect the frequency response of the system. Any specially constructed shielding should also use a similar resistor with inductive signal sources. The inductances are sometimes the residual inductance of a wire-wound resistor, or the effect of the mass of a crystal transducer, as well as components designed primarily to be inductors.

TABLE I

MAXIMUM UNDISTORTED SHIELD VOLTAGE

Frequency (cps)	RMS Voltage at Driven Shield Capacitance of		
	100 pf	300 pf	1000 pf
1,000	40	40	40
3,000	40	40	40
10,000	40	40	35
30,000	40	38	20
100,000	30	13	3.5
200,000	15	3	1.5

SECTION IV MAINTENANCE

The gains of the Model 102B should remain at their initial values indefinitely, because of the stability of the precision film resistors and large negative feedback. It is advisable, however, that the midband gains and high frequency response be checked occasionally with precision instruments to assure continuing accuracy.

To make any readjustments, it is necessary to remove the cabinet from the chassis and panel assembly. After the two screws on each side of the cabinet are removed, the cabinet can easily be slipped off. For safety, the power should be turned off during disassembly and re-assembly.

Table II, below, shows the working gains of the two amplifier circuits and the attenuation between them to obtain the various gains marked on the panel. The middle amplifier is the V3-V4 circuit, and the output amplifier is V5 and V6.

TABLE II

GAINS OF VARIOUS SECTIONS OF MODEL 102B

Gain Step	Input Stage	Middle Amplifier	Voltage Divider	Output Amplifier	Overall Gain
0.1	1.0	-	1/100	10	0.1
1.0	1.0	-	1/10	10	1.0
10	1.0	-	-	10	10
100	1.0	100	1/10	10	100
1000	1.0	100	-	10	1000

Both the middle and output amplifiers use large amounts of negative feedback to stabilize their gains, which should remain accurate as long as the components in the amplifier are working properly. If an error in the gain is detected, the tubes are most probably at fault. If the tubes appear satisfactory, however, their electrode potentials should be checked to ascertain that the plate and filament supplies and the amplifier components are in working order.

Troubles can be localized by noting that on Gain of 10, only the input and output amplifiers are in the circuit, and on Gain of 1000 all three amplifiers are connected directly. Other steps use the voltage dividers as well as the amplifiers.

At the factory, the high frequency responses are trimmed in by the following steps:

1. Gain at 10, C313 (output amplifier trimmer) is adjusted for zero gain error at 300 kc.
2. Gain at 1000, C208 (middle amplifier trimmer) is adjusted for zero gain error at 300 kc.
3. Gain at 100, C301 (divider padder) is adjusted for zero gain error at 300 kc.

4. Gain at 1.0, C302 is adjusted for zero error at 300 kc.
5. Gain at 0.1, C303 is adjusted for zero error at 300 kc.

NOTE: There is interaction between the settings of steps 4 and 5, and the final setting is reached through successive approximations.

The two amplifier trimmers are located adjacent to their associated tubes, and are accessible from the tube side of the instrument, with the cabinet removed. The divider padders are mounted on the bracket holding the gain switch to the chassis, and are labelled 100, 1 and 0.1 for the gains which they adjust.

All readjustments, of course, should be carefully made with very accurate instruments.

The frequency response and gain of the input stage should not change unless something is radically wrong.

The circuit schematic diagram gives typical dc operating potentials at various parts of the circuit; any large deviation indicates abnormal performance.

The fuse is located at the rear of the instrument. If it fails, the instrument should be checked to determine the cause of the overload, and the circuit corrected before inserting another fuse. It is dangerous to use a fuse rated at more than 1.5 ampere, or to wire the fuse clips together. For 230-volt operation, the fuse should be 0.75 ampere.

The tubes used are not especially selected, and any tube of the proper type should work satisfactorily, except, perhaps, for the 5651 which is discussed in the following paragraph.

The regulated B+, as measured at the cathode of V6(12B4A), should be between 220 to 230 volts, to assure proper regulation with variations in line voltage and enough plate voltage for rated output. This should be kept in mind when replacing V8(5651), for some extreme tube potentials cause the regulated B+ to be outside the 220-230 volt limits. If difficulty is encountered, it can be corrected by using another 5651 or by shunting R511 or R512.

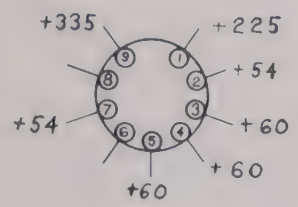
The low level tubes in the instrument are Amperex type EF86 — available from all Amperex distributors. If any difficulty in obtaining them is encountered, replacements are available from Keithley.

Circuit Desig.	Description	Keithley Part No.
C101	Capacitor, 0.0022 uf, 1600V	C13-.0022
C102	Capacitor, electrolytic, 4 uf, 350V	C23-4
C103	Capacitor, ceramic, 0.0033 uf, 600V	C22-.0033
C104	Capacitor, electrolytic, 4 uf, 250V	C27-4
C105	Capacitor, electrolytic, 20 uf, 250V	C27-20
C106	Capacitor, mica, 270 pf, 500V	C21-270
C107	Capacitor, ceramic, 0.01 uf, 600V	C22-.01
C108	Capacitor, electrolytic, 4 uf, 250V	C27-4
C201	Capacitor, ceramic, 0.1 uf, 400V	C30-.1
C202	Capacitor, 4 uf, 350V	C23-4
C203	Capacitor, 4 uf, 250V	C27-4
C204	Capacitor, ceramic, 0.0047 uf, 600V	C22-.0047
C205	Capacitor, electrolytic, 20 uf, 250V	C27-20
C206	Capacitor, 4 uf, 250V	C27-4
C207	Capacitor, mica, 500 pf, 500V	C21-500
C208	Capacitor, variable, 1-8 pf	C28-1-8
C301	Capacitor, variable, 1.5-7 pf	C28-1.5-7
C302	Capacitor, variable, 3-12 pf	C28-3-12
C303	Capacitor, variable, 1.5-7 pf	C28-1.5-7
C304	Capacitor, ceramic, 47 pf, 600V	C22-47
C305	Capacitor, ceramic, 100 pf, 600V	C22-100
C306	Capacitor, ceramic, 680 pf, 600V	C22-680
C307	Capacitor, ceramic, 0.33 uf, 200V	C29-.33
C308	Capacitor, 4 uf, 350V	C23-4
C309	Capacitor, ceramic, 0.01 uf, 600V	C22-.01
C310	Capacitor, 4 uf, 250V	C27-4
C311	Capacitor, mica, 68 pf, 500V	C21-68
C312	Capacitor, 4 uf, 250V	C27-4
C313	Capacitor, variable, 0.5-5.0 pf	C28-.5-5
C314	Capacitor, electrolytic, 40 uf, 250V	C27-40
C315	Capacitor, electrolytic, 20 uf, 250V	C27-20
C316	Capacitor, ceramic, 100 pf, 600V	C22-100
C501	Capacitor, electrolytic, 40 uf, 350V	C23-40
C502	Capacitor, electrolytic, 40 uf, 350V	C23-40
C503	Capacitor, electrolytic, 10 uf, 450V	C8-10
C504	Capacitor, electrolytic, 1000 uf, 15V	C11-1000
C505	Capacitor, ceramic, 0.01 uf, 600V	C22-.01
C506	Capacitor, ceramic, 0.1 uf, 400V	C30-.1
C507	Capacitor, electrolytic, 10 uf, 450V	C8-10
R101	Resistor, composition, 22M, 1/2W, 10%	R1-22M
R102	Resistor, deposited carbon, 47K, 1/2W, 1%	R12-47K
R103	Resistor, composition, 2.2K, 1/2W, 10%	R1-2.2K
R104	Resistor, composition, 2.2K, 1/2W, 10%	R1-2.2K
R105	Resistor, deposited carbon, 22K, 1/2W, 1%	R12-22K

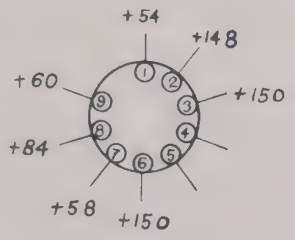
Circuit Desig.	Description	Keithley Part No.
R106	Resistor, composition, 220K, 1/2W, 10%	R1-220K
R107	Resistor, composition, 47K, 1/2W, 10%	R1-47K
R108	Resistor, composition, 22K, 2W, 10%	R3-22K
R109	Resistor, composition, 2.2M, 1/2W, 10%	R1-2.2M
R110	Resistor, composition, 330 ohms, 1/2W, 10%	R1-330
R111	Resistor, composition, 68K, 1/2W, 10%	R1-68K
R201	Resistor, composition, 2.2M, 1/2W, 10%	R1-2.2M
R202	Resistor, composition, 2.2K, 1/2W, 10%	R1-2.2K
R203	Resistor, deposited carbon, 22K, 1W, 1%	R13-22K
R204	Resistor, composition, 100K, 1/2W, 10%	R1-100K
R205	Resistor, 30K, 288, matched set, 1/4%	R23-S4
R206	Resistor, 30K, 288, matched set, 1/4%	R23-S4
R207	Resistor, composition, 47 ohms, 1/2W, 10%	R1-47
R208	Resistor, composition, 10M, 1/2W, 10%	R1-10M
R209	Resistor, composition, 22K, 2W, 10%	R3-22K
R210	Resistor, composition, 150K, 1/2W, 10%	R1-150K
R301	Resistors, 90K, 10K, matched set, 1/4%	R23-S1
R302	Resistors, 90K, 10K, matched set, 1/4%	R23-S1
R303	Resistors, 90K, 9K, 1K, matched set, 1/4%	R23-S2
R304	Resistors, 90K, 9K, 1K, matched set, 1/4%	R23-S2
R305	Resistors, 90K, 9K, 1K, matched set, 1/4%	R23-S2
R306	Resistor, composition, 2.2M, 1/2W, 10%	R1-2.2M
R307	Resistor, composition, 2.2K, 1/2W, 10%	R1-2.2K
R308	Resistor, composition, 22K, 2W, 10%	R13-22K
R309	Resistor, composition, 68K, 1/2W, 10%	R1-68K
R310	Resistors, 1.036K and 10K, matched set, 1/4%	R23-S3
R311	Resistor, deposited carbon, 1000 ohms, 1/2W, 1%	R12-1000
R312	Resistor, composition, 1 megohm, 1/2W, 10%	R1-1M
R313	Resistor, composition, 15K, 2W, 10%	R3-15K
R314	Resistor, composition, 100K, 1/2W, 10%	R1-100K
R315	Resistor, composition, 100 ohms, 1/2W, 10%	R1-100
R316	Resistor, composition, 390 ohms, 1/2W, 10%	R1-390
R317	Resistor, composition, 22K, 2W, 10%	R3-22K
R318	Resistors, 1.036K, and 10K, matched set, 1/4%	R23-S3
R319	Resistor, composition, 10K, 1/2W, 10%	R1-10K
R501	Resistor, composition, 100 ohms, 1/2W, 10%	R1-100
R502	Resistor, composition, 470K, 1/2W, 10%	R1-470K
R503	Resistor, composition, 470K, 1/2W, 10%	R1-470K
R504	Resistor, composition, 470K, 1/2W, 10%	R1-470K
R505	Resistor, composition, 100K, 1/2W, 10%	R1-100K
R506	Resistor, wirewound, 5 ohms, 5W, 3%	R4-5
R507	Resistor, composition, 33K, 1/2W, 10%	R1-33K
R508	Resistor, composition, 33K, 1/2W, 10%	R1-33K
R509	Resistor, composition, 10M, 1/2W, 10%	R1-10M
R510	Resistor, composition, 220K, 1/2W, 10%	R1-220K

Circuit Desig.	Description	Keithley Part No.
R511	Resistor, deposited carbon, 1M, 1/2W, 1%	R12-1M
R512	Resistor, deposited carbon, 600K, 1/2W, 1%	R12-600K
R513	Resistor, composition, 10M, 1/2W, 10%	R1-10M
SR1	Rectifier, selenium, bridge, 26V, 0.6A	RF-7
T1	Transformer, power 115/230V	TR-19
V1	Vacuum tube, type EF86/6267	EV-6267
V2	Vacuum tube, type EF86/6267	EV-6267
V3	Vacuum tube, type EF86/6267	EV-6267
V4	Vacuum tube, type 6CB6	EV-6CB6
V5	Vacuum tube, type EV86/6267	EV-6267
V6	Vacuum tube, type 6BH8	EV-6BH8
V7	Vacuum tube, type 6X4	EV-6X4
V8	Vacuum tube, type 12B4A	EV-12B4A
V9	Vacuum tube, type 12AX7	EV-12AX7
V10	Vacuum tube, type 0G3	EV-0G3
	Fuse, 1.5 ampere, 250V	FU-8

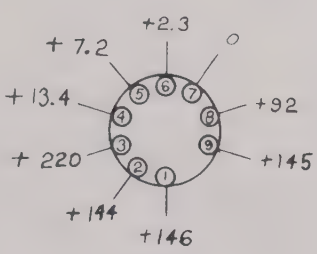
REVISIONS		
SYM	DESCRIPTION	DATE



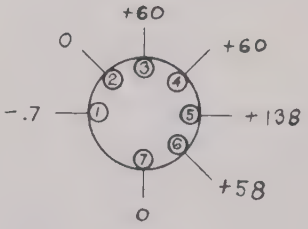
V8
12B4A



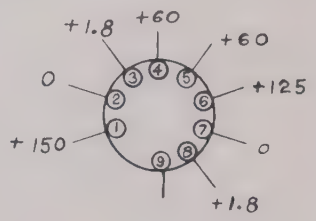
V9
12AX7



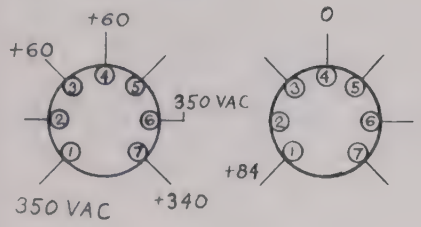
V6
6BH8



V4
6CB6



V2
EF86



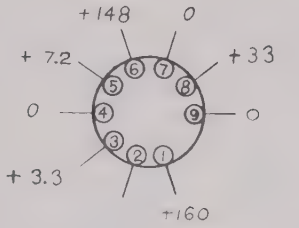
V7
6X4

V10
OG3

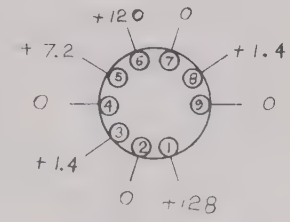
NOTE:
MEASUREMENTS MADE WITH
GAIN SW AT ×1 POSITION
*GAIN SW AT ×100 POSITION

DC POTENTIALS MEASURED WITH
11 MEGOHM VTVM

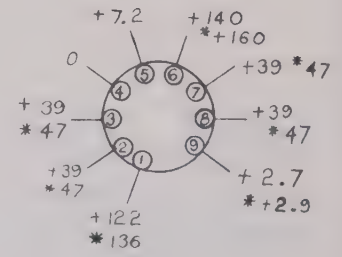
V5
EF86



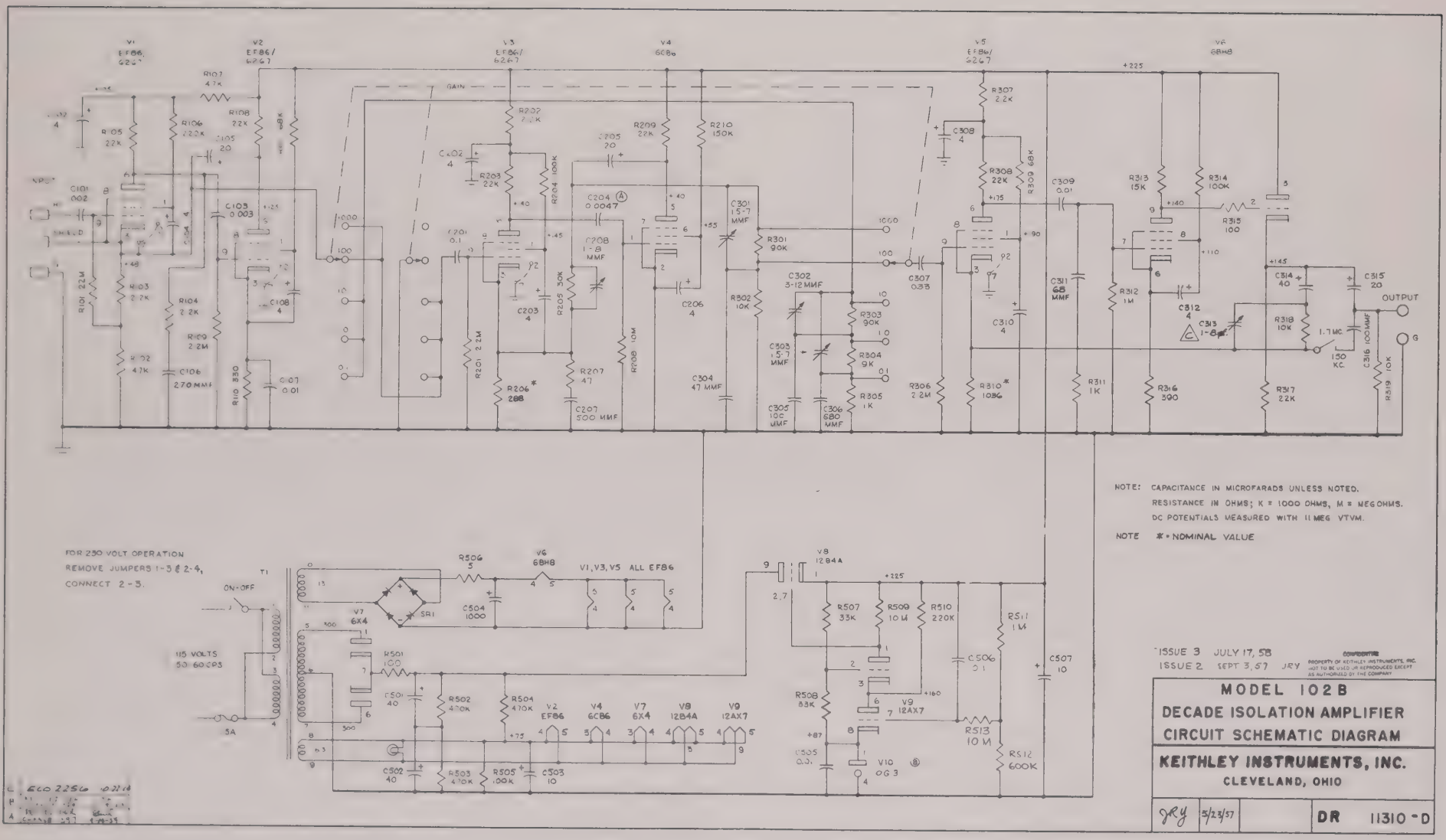
V3
EF86



V1
EF86



MATERIAL			FINISH			
DIMENSIONAL TOLERANCES UNLESS OTHERWISE SPECIFIED			TITLE MODEL 102B VOLTAGE CHART		KEITHLEY INSTRUMENTS, INC. CLEVELAND, OHIO	
FRAC.	DEC	ANG				
± 1/64	± .005	± 30'				
SCALE	NO REQ'D	DRAWN	DATE 5-26-60	ISSUE	DRAWING NUMBER	SIZE
NEXT ASSY		CHECKED	DATE		13467 B	
		APPROVED	DATE			


V1 EF86, 6267
V2 EF86/ 6267
V3 EF86/ 6267
V4 6CB6
V5 EF86/ 6267
V6 6BH8
GAIN
R107 4.7K
R105 22K
R106 22K
R108 22K
C105 20
C101 .002
C103 0.003
C104 4
C108 4
R101 22M
R103 2.2K
R102 4.7K
R104 2.2K
R109 2.2M
C106 270 MMF
R110 330
C107 0.01
C201 0.1
R201 2.2M
R202 2.2K
C202 4
R203 22K
R204 100K
C203 4
R205 30K
R206* 288
R207 47
C207 500 MMF
C208 1-8 MMF
R208 10M
C204 0.0047
C205 20
R209 22K
R210 150K
C206 4
C301 1.5-7 MMF
R301 90K
R302 10K
C302 3-12 MMF
C303 1.5-7 MMF
C305 100 MMF
C306 680 MMF
R303 90K
R304 9K
R305 1K
C304 47 MMF
R306 2.2M
C307 0.33
R307 2.2K
C308 4
R308 22K
R309 68K
C309 0.01
C310 4
R310* 108Ω
C311 68 MMF
R311 1K
R312 1M
C312 4
C313 1-8
R313 15K
R314 100K
R315 100
C314 40
C315 20
R316 390
R317 22K
R318 10K
1.7 MC.
150 KC.
C316 100 MMF
R319 10K
OUTPUT
G
NOTE: CAPACITANCE IN MICROFARADS UNLESS NOTED.
RESISTANCE IN OHMS; K = 1000 OHMS, M = MEGOHMS.
DC POTENTIALS MEASURED WITH 11 MEG VTVM.
NOTE * = NOMINAL VALUE
FOR 230 VOLT OPERATION
REMOVE JUMPERS 1-3 & 2-4,
CONNECT 2-3.
T1
ON-OFF
115 VOLTS
50-60 CPS
3A
V7 6X4
SR1
R506 5
C504 1000
V6 6BH8
V1, V3, V5 ALL EF86
R501 100
C501 40
R502 470K
R504 470K
C502 40
R503 470K
R505 100K
C503 10
V2 EF86
V4 6CB6
V7 6X4
V8 12B4A
V9 12AX7
V8 12B4A
R507 33K
R509 10 M
R510 220K
R511 1 M
C506 .01
C507 10
R508 83K
R513 10 M
R512 600K
C505 .01
V9 12AX7
V10 OG 3
ISSUE 3 JULY 17, 58
ISSUE 2 SEPT. 3, 57 JRY
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AS AUTHORIZED BY THE COMPANY
MODEL 102B
DECADE ISOLATION AMPLIFIER
CIRCUIT SCHEMATIC DIAGRAM
KEITHLEY INSTRUMENTS, INC.
CLEVELAND, OHIO
JRY 5/23/57
DR 11310-D
ECO 2256 10-31-58

CHANGE NOTICE

November 6, 1968 MODEL 1028 AMPLIFIER

Change 1: Change to the following:

C413 Capacitor, variable, 1-8 pf Keithley part C28-1/8P

Change to read:

Change the value of C413 to 1/2 pf.

KEITHLEY INSTRUMENTS, INC.
12415 EUCLID AVENUE CLEVELAND, OHIO 44106